Abstract

Background—It is important to diagnose asthma at an early stage as early treatment may improve the prognosis in the long term. However, many patients do not present at an early stage of the condition so the physician may have difficulty with the diagnosis. A study was therefore undertaken to compare the proportion of patients who underpresented their respiratory symptoms with the proportion of underdiagnosed cases of asthma by the general practitioner (GP). A secondary aim was to investigate whether bad perception of dyspnoea by the patient was a determining factor in the underpresentation of asthma symptoms to the GP.

Methods—A random sample of 1155 adult subjects from the general population in the eastern part of the Netherlands was screened for respiratory symptoms and lung function and the results were compared with the numbers of asthma related consultations registered in the medical files of the GP. In subjects with reduced lung function the ability to perceive dyspnoea was investigated during a histamine provocation test in subjects who did and did not report their symptoms to their GP.

Results—Of the random sample of 1155 subjects 86 (7%) had objective airflow obstruction (forced expiratory volume in one second (FEV₁) below the reference value corrected for age, length, and sex minus 1.64SD on two occasions) and had symptoms suggestive of asthma. Of these 86 subjects only 29 (34%) consulted the GP, which indicates underpresentation by 66% of patients. Of all subjects with objective airflow obstruction who presented to their GP with respiratory symptoms, 23 (79%) were recorded in the medical files as having asthma, indicating underdiagnosis by the GP in 21% of cases. Of the subjects with objective airflow obstruction who visited the GP with respiratory symptoms 6% had bad perception of dyspnoea compared with 26% of those who did not present to the GP in spite of airflow obstruction ($\chi^2 = 3.02, p = 0.08$).

Conclusions—Underpresentation to GPs of respiratory symptoms by asthmatic patients contributes significantly to the problem of underdiagnosis of asthma. Underdiagnosis by the GP seems to play a smaller role. Furthermore, there are indications that underpresentation of symptoms by the patient is at least partly explained by a worse perception of dyspnoea.

Keywords: asthma; underdiagnosis; underpresentation; general practice

There is still an increase in the morbidity and mortality of asthma which seems to apply to patients diagnosed as having asthma as well as to those in whom a diagnosis of asthma has not yet been made. Underdiagnosis and consequent undertreatment might be important in the increased morbidity and mortality of asthma. Early detection and treatment of asthma might improve the long term prognosis of these patients and this secondary prevention may also prevent irreversible loss of function. It is not clear whether the physician or the patient is to blame: is underdiagnosis of asthma caused by the physician who does not adequately interpret the symptoms presented to him (or her) or is it caused by the patient who does not present his or her symptoms to the physician? In the latter case it is not clear why a patient does not present his or her symptoms to the GP. Is this caused by poor perception of the symptom of dyspnoea in particular?

The primary aim of this study was to compare the numbers of cases of underpresentation of respiratory symptoms by the patient with underdiagnosis by the GP. A secondary aim was to investigate whether the perception of dyspnoea by patients plays a part in the possible underpresentation of symptoms of asthma to the GP.

Methods

STUDY DESIGN

This study is part of a larger study, the DIMCA project (early Detection, Intervention and Monitoring of Asthma and COPD) carried out by the Department of General Practice and Social Medicine of the University of Nijmegen. The project has been ongoing since 1991 and its aim is the early detection, monitoring and, if necessary, early treatment of patients with asthma and chronic obstructive pulmonary disease (COPD).

PATIENTS

A random sample of 1155 subjects aged 25–70 was selected from 10 urban and rural general practices in the eastern part of the Netherlands. In the Netherlands all subjects in the general population are registered in the files of
Table 1 Patient characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Participants* (n = 1155)</th>
<th>Refusals† (n = 34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) FEV1 (% predicted)</td>
<td>96.4 (14.6)</td>
<td>96.1 (17.5)</td>
</tr>
<tr>
<td>FEV1, reversibility (%)‡‡</td>
<td>3.3 (4.1)</td>
<td></td>
</tr>
<tr>
<td>Sex (% female)</td>
<td>55.3</td>
<td>61.8</td>
</tr>
<tr>
<td>Mean (SD) age (years)</td>
<td>43.2 (11.8)</td>
<td>45.2 (13.4)</td>
</tr>
<tr>
<td>Childhood eczema (%)†</td>
<td>11.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Current smokers (%)</td>
<td>37</td>
<td>39</td>
</tr>
<tr>
<td>Ever smokers (%)</td>
<td>70</td>
<td>71</td>
</tr>
</tbody>
</table>

FEV1 = forced expiratory volume in one second.

*Subjects (n = 1155) who participated in the study. Initially 1988 were sampled, 239 were excluded (known asthma or COPD, congestive heart failure, lung diseases other than asthma or COPD, life expectancy less than 11 years) and 594 refused or did not respond.

†Random sample of subjects (34 of 594) who refused to participate.

‡Reversibility in FEV1 at 15 minutes after inhalation of 800 µg salbutamol; not assessed in subjects screened at home (as this was an important reason for refusing to participate).

‡†Percentage of affirmative answers to questionnaire: “Did you ever experience eczema in childhood?”

Underdiagnosis of asthma

Asthma related consultation in file at GP surgery 23 (79%) 6 (21%)
Presented symptoms to GP 29 (34%) 57 (66%)

Table 2 Subjects with objective airflow obstruction and symptoms suggestive of asthma selected from the general population (n = 86): underpresentation by patients and underdiagnosis by general practitioners (GPs)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presented symptoms to GP</td>
<td>29 (34%)</td>
<td>57 (66%)</td>
</tr>
<tr>
<td>Asthma related consultation in file at GP surgery</td>
<td>23 (79%)</td>
<td>6 (21%)</td>
</tr>
</tbody>
</table>

Results

Of the random sample of 1155 subjects, 86 had objective airflow obstruction as well as symptoms suggestive of asthma. The number of subjects with asthma related consultations in the GP files and the number who had consulted the GP with symptoms suggestive of asthma are shown in table 2. Of the 86 subjects only 29 (34%) had ever presented their symptoms to the GP; thus, 66% of the subjects had not consulted their GP even though they had objective airflow obstruction. Of the 29 subjects who had consulted their GP, however, six (21%) were not diagnosed as having asthma by the GP.

Forty seven subjects from the general population sample with decreased FEV1 were investigated as to their ability to perceive dyspnoea by means of a histamine provocation test and Borg score measurements (table 3). Of the 16 subjects who had presented to the GP, 15 (94%) were “good perceivers” and one (6%) was categorised as a “poor perceiver”. Of the 31 subjects who had not presented to the GP, 23 (74%) were categorised as “good perceiv-
ers” and eight (26%) as “poor perceivers”.

Although the difference was more than fourfold, it was not statistically significant (χ² = 3.02, p = 0.08). However, if an FEV₁ value of ≤70% or 60% of the reference value is used as a more strict limit for an objective pulmonary disorder, the tendency is clearer, with no subjects who presented with symptoms to the GP being a “poor perceiver” of dyspnoea compared with 19% and 33%, respectively, of patients with an FEV₁ of ≤70% or 60% on two occasions who did not present to their GP with symptoms in spite of having an objective pulmonary abnormality.

**Discussion**

The question of the extent to which the presentation of symptoms by the patient to the GP is preceded by another question—namely, GP is picked up and translated into a diagnosis—is critical for the quality of care and the patient’s perception of the healthcare system. The question of the extent to which the patient presents the symptoms to the GP. It is also important to note that only a minority of the subjects with objective lung function in the general population with only 86 subjects who did visit the GP in spite of bronchial obstruction, the percentage with a poor perception of dyspnoea was more than four times higher at 26%. Because of the small number of patients studied, these figures are not significant but, when subjects with more severe airway obstruction were considered, the tendency was clearly confirmed. It could be argued that, because a poor perception of dyspnoea seems to determine, at least in part, the perception of symptoms, its improvement might logically result in better presentation of symptoms.20

**Table 3** A random sample of 47 subjects with obstructive airflow obstruction selected from the general population: relation between presentation of symptoms to the general practitioner (GP) and the perception of dyspnoea

<table>
<thead>
<tr>
<th>Perception</th>
<th>Poor</th>
<th>Good</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presented symptoms to GP</td>
<td>Yes</td>
<td>1 (6%)</td>
<td>15 (94%)</td>
</tr>
<tr>
<td>No</td>
<td>8 (26%)</td>
<td>23 (74%)</td>
<td>31 (66%)</td>
</tr>
<tr>
<td>Total</td>
<td>9 (19%)</td>
<td>38 (81%)</td>
<td>47 (100%)</td>
</tr>
</tbody>
</table>

One of the factors in determining the role of perception by the patients, neither the physician nor the patient is to blame for the underdiagnosis of asthma but, rather, is limited to the perception of dyspnoea. The objective parameter most related to dyspnoea is the reduction in FEV₁.

We have investigated whether the ability to perceive airway obstruction determines whether or not a patient visits his or her GP with concomitant airway symptoms (dyspnoea). It should be pointed out that the time at which the question concerning the presentation of symptoms was answered and the time at which the perception of dyspnoea was measured were not synchronous, and this may have confounded the results. Another problem is that the presence of airway obstruction does not always result in the presence of bronchial symptoms.20 There are even indications that patients with more severe asthma have a reduced perception of dyspnoea.21

This study has shown that the perception of dyspnoea seems to determine, at least in part, the presentation to the GP with symptoms. Of the subjects with bronchial obstruction who did visit the GP with airway symptoms, 6% had a poor perception of dyspnoea while, of the subjects who did not visit the GP in spite of bronchial obstruction, the percentage with a poor perception of dyspnoea was more than four times higher at 26%. Because of the small number of patients studied, these figures are not significant but, when subjects with more severe airway obstruction were considered, the tendency was clearly confirmed. It could be argued that, because a poor perception of dyspnoea is probably a cause of underpresentation by the patients, neither the physician nor the patient is to blame for the underdiagnosis of asthma in the general population.

One limitation of this study was the relatively small number of subjects with reduced lung function in the general population with only 86 of 1155 subjects having clear reduced lung function.

One of the factors in determining the role of perception of airway obstruction in the underpresentation of respiratory symptoms is the ability to influence this perception positively. If perception plays a large part in the presentation of symptoms, its improvement might logically result in better presentation of symptoms which could contribute to an early diagnosis of asthma.22 It is important to know the level at which perception could possibly be influenced. If the process of perceiving takes place at the cellular level, a positive influence on the ability to perceive is attributed to corticosteroids. Roisman et al23 claim that perception by asthmatic subjects is related to the presence of eosinophilic inflammatory cells and epithelial damage in the airways. They conclude that corticosteroids are associated with improvement in the perception of bradykinin induced bronchoconstriction, a mediator produced endogenously in asthma. However, this would not be helpful for subjects who are not yet diagnosed and who therefore would not be treated with steroids. In case of a more psychological or behavioural foundation to percep-
Underdiagnosis of asthma

In summary, underpresentation of respiratory symptoms by asthmatic patients plays probably the most important role in the under-diagnosis of this disease. Furthermore, there are indications that underpresentation of symptoms by patients is caused by a decreased perception of dyspnoea. Future research should focus on possible methods of improving the perception and awareness of patients with symptoms of asthma.

Underdiagnosis of asthma: is the doctor or the patient to blame? The DIMCA project

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